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Laura Wills Mirkarimi

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EXAMINER

DEO, DUY VU NGUYEN

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* LAURA WILLS MIRKARIMI

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Appeal 2009-010057  
Application 10/765,647  
Technology Center 1700

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Decided: June 30, 2010

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Before MICHAEL P. COLAIANNI, BEVERLY A. FRANKLIN, and  
KAREN M. HASTINGS, *Administrative Patent Judges*.

COLAIANNI, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant appeals under 35 U.S.C. § 134 the final rejection of claims 1-20. We have jurisdiction over the appeal pursuant to 35 U.S.C. § 6(b).

We AFFIRM.

Appellant's invention is said to relate to a method of etching III-V semiconductor material using a gas mixture composed of HBr, HI, or IBr, CH<sub>4</sub>, and H<sub>2</sub> (Spec. 2). The particular gas mixture is said to provide a fast etch rate, vertical sidewalls in the etched feature, and good control over the

growth of polymers that arise from the presence of CH<sub>4</sub> in the mixture (Spec. 2).

Claim 1 is illustrative:

1. A method for etching a III-V semiconductor material comprising: placing a semiconductor substrate on which said III-V semiconductor material has been deposited into a reactive ion etching reactor;

introducing a first gas chosen from HBr, HI and IBr into said reactive ion etching reactor;

introducing a second gas of CH<sub>4</sub> into said reactive ion etching reactor;

introducing a third gas of H<sub>2</sub>; and

exposing a portion of said III-V semiconductor material to be etched to a mixture comprising said first, said second and said third gas.

Appellant appeals the following rejection:

Claims 1-20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Fathimulla (U.S. Patent 5,338,394, Aug. 16, 1994) in view of Pearton (*Appl. Phys. Lett.* 60(7), 838-40 Feb. 17, 1992).

Since Appellant makes the same argument regarding independent claims 1 and 12, we select claim 1 as representative. 37 C.F.R. § 41.37(c)(1)(vii).

## ISSUE

Did the Examiner err in determining that the teachings of the references as a whole would have suggested adding H<sub>2</sub> as taught by Pearton to the CH<sub>4</sub> and HBr gas mixture of Fathimulla to achieve the claimed invention? We decide this issue in the negative.

### PRINCIPLE OF LAW

A reference that teaches away cannot serve to create a prima facie case of obviousness. *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994). A reference may be said to teach away “when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant.” *Id.* “The degree of teaching away will of course depend on the particular facts; in general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant.” *Id.*

To constitute a teaching away a reference must indicate that a particular feature should not or cannot be used for a particular purpose. *Para-Ordnance Mfg. Inc. v. SGS Importers Int’l Inc.*, 73 F.3d 1085, 1090 (Fed. Cir. 1995).

### FACTUAL FINDINGS (FF)

We adopt the Examiner’s findings in the Answer and Final Office Action as our own. We add the following factual findings:

1. Fathimulla teaches using a mixture of HBr or SiCl<sub>4</sub> with CH<sub>4</sub> or H<sub>2</sub> to etch a group III-V semiconductor material such as InP (col. 2, ll. 12-27).
2. Fathimulla is silent regarding combining CH<sub>4</sub> and H<sub>2</sub> gases with HBr.
3. Pearton discloses that using H<sub>2</sub> gas with an HI/Ar mixture provides a smoother etched surface but decreases the etching rate (839).

4. Pearton further discloses that using  $\text{CH}_4$  and  $\text{H}_2$  as the etching gas provides a slower etch than using  $\text{HI}/\text{Ar}$  and  $\text{H}_2$  as the etching gas (838).

Additional findings of fact may be present in the analysis that follows.

### ANALYSIS

Appellant argues that Fathimulla and Pearton teach away from combining  $\text{CH}_4$ ,  $\text{H}_2$ , and  $\text{HBr}$  (App. Br. 9-12). Appellant argues that Fathimulla's teachings to use either  $\text{CH}_4$  or  $\text{H}_2$  with  $\text{HBr}$  would not have directed one of ordinary skill to use  $\text{CH}_4$  and  $\text{H}_2$  together in the gas mixture and instead would have led in a direction divergent from the path taken by Appellant (App. Br. 10). Appellant further argues that Pearton's teaching that  $\text{CH}_4/\text{H}_2$  gas mixtures have slow etch rates would have discouraged one of ordinary skill in the art from introducing  $\text{CH}_4$  and  $\text{H}_2$  into the reactor and thus would not have led an ordinarily skilled artisan to combine  $\text{CH}_4$  and  $\text{H}_2$  with  $\text{HBr}$  and arrive at the claimed invention (App. Br. 11). Appellant contends that Examiner used impermissible hindsight in making the combination (App. Br. 13-14).

Appellant's arguments, however, improperly attack the references individually and fail to address the Examiner's stated case. Specifically, the Examiner's stated case is based on the teachings of Fathimulla and Pearton as a whole. Indeed, the Examiner finds that Fathimulla teaches using an etching gas containing  $\text{CH}_4$  and  $\text{HBr}$ , but is silent regarding the use of  $\text{H}_2$  with the etching gas mixture (Ans. 3). The Examiner relies on Pearton's teaching that adding  $\text{H}_2$  to an etchant gas provides a smooth etched surface (Ans. 3). Based on these teachings the Examiner concludes that it would

have been obvious to add  $H_2$  to Fathimulla's etching gas mixture to produce a smooth vertical feature (Ans. 3). Appellant does not contest the Examiner's reason for combining Pearton's  $H_2$  with Fathimulla's etching gas mixture.

Appellant's teaching away arguments fail to consider the nature of Fathimulla's and Pearton's teachings. Specifically, Fathimulla's teachings to use either  $CH_4$  or  $H_2$  with  $HBr$  do not discourage the use of the two gases together. Rather, Fathimulla teachings indicate to one of ordinary skill in the art that it is known that  $CH_4$  or  $H_2$  are known etching gases. Fathimulla's silence concerning the addition of  $CH_4$  and  $H_2$  together does not constitute a teaching away. *Para-Ordinance*, 73 F.3d at 1090.

Moreover, Pearton's teaching that it is known to use  $CH_4$  and  $H_2$  together supports using the two gases together. While Pearton teaches that using a mixture of  $CH_4$  and  $H_2$  has a slower etch rate and such use may deposit polymer on the substrate, Pearton further teaches that the  $CH_4$  and  $H_2$  mixture provide a smooth etch to In-containing III to V semiconductor materials (Pearton 838). The nature of Pearton's teachings do not constitute a teaching away. Rather, one of ordinary skill in the art would understand from Pearton's teachings that  $CH_4$  and  $H_2$  mixture may be used as an etching gas to produce smooth etched features with the attendant slower etch rate and polymer deposition.

Indeed, Pearton teaches that adding  $H_2$  to the etching  $HI/Ar$  gas mixture slows down the etching rate and provides for a smoother etched surface (Pearton 839). Accordingly, we find Appellant's teaching away arguments to be without persuasive merit.

Appellant's impermissible hindsight argument fails because Pearton plainly teaches adding H<sub>2</sub> to an etching gas mixture for the purpose of providing a smoother etched surface. In other words, the Examiner's combination is based on the teachings of the art not impermissible hindsight.

For the reasons discussed, we affirm the Examiner's § 103 rejection of claims 1-20 as being unpatentable over Fathimulla in view of Pearton.

#### DECISION

The Examiner's decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1).

#### AFFIRMED

PL Initial:  
sld

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